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MECHANIZATION AND THE SEASONAL FARMWORKER.

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MECHANIZATION DOES NOT NECESSARILY DECREASE THE NUMBER OF SEASONAL FARM WORKERS NEEDED. SOME INNOVATIONS MERELY CHANGE THE JOB TO ONE THAT IS LESS UNPLEASANT, AND WORKERS FORMERLY DISINCLINED TO DO THE JOB BECOME AVAILABLE. MECHANIZATION MAY MAKE AN OPERATION SO EFFICIENT THAT ACREAGE AND PRODUCTION ARE INCREASED, AND MORE WORKERS ARE NEEDED. MUCH MECHANIZED HARVESTING IS NOT ECONOMICALLY PRACTICAL ALTHOUGH COMPETITION IS FORCING GROWERS AND PROCESSORS TO REEXAMINE BELIEFS THAT CONSUMERS WILL NOT ACCEPT MACHINE HARVESTED PRODUCTS OR THAT GROWING CONDITIONS ARE NOT SUITABLE FOR MACHINE USE. MECHANIZATION SUGGESTS THE CREATION OF NEW MACHINES BUT MAY ALSO TAKE THE FORM OF TIME-SAVING INNOVATIONS INCLUDING PRECISION PLANTING, CHEMICAL TREATMENT FOR WEEDS, NEW KINDS OF SEEDS, AND HORTICULTURAL DEVELOPMENTS OF PLANT VARIETIES SUITABLE FOR MACHINE HARVESTING. THE PROSPECTS FOR MECHANIZATION OF TOBACCO, COTTON, STRAWBERRIES, TOMATOES, SNAP BEANS, BUSHBERRIES, POTATOES, SUGAR CROPS, GRAPES, CHERRIES, APPLES, CITRUS, CUCUMBERS, ASPARAGUS, CELERY, PEACHES, AND OTHER TREE FRUITS, AND STATES WHERE THE NEED FOR SEASONAL WORKERS IS GREATEST OR MOST DIFFICULT TO FILL ARE DISCUSSED. MECHANIZATION WILL PROBABLY HAVE THE GREATEST IMPACT ON COTTON CHOPPING IN THE SOUTH, SNAP BEAN HARVESTING IN THE PACIFIC NORTHWEST, AND CHERRY HARVESTING IN THE MIDWEST. TOBACCO, STRAWBERRY, AND CITRUS HARVESTING PRESENT SEEMINGLY INSUPERABLE PROBLEMS, AND PEAK LABOR NEEDS FOR THESE CROPS WILL REMAIN HIGH. LABOR SAVINGS DUE TO INNOVATIONS IN COTTON HARVESTING AND SUGAR BEET CULTIVATION HAVE ALMOST RUN THEIR COURSE. SOME FORM OF MECHANIZATION IS POSSIBLE IN ALMOST ALL CROPS DEPENDING ON ECONOMIC PRESSURES AFFECTING PRODUCTION OF THE CROP IN ANY GIVEN AREA. THIS DOCUMENT APPEARED IN "FARM LABOR DEVELOPMENTS," APRIL 1967. (WB)

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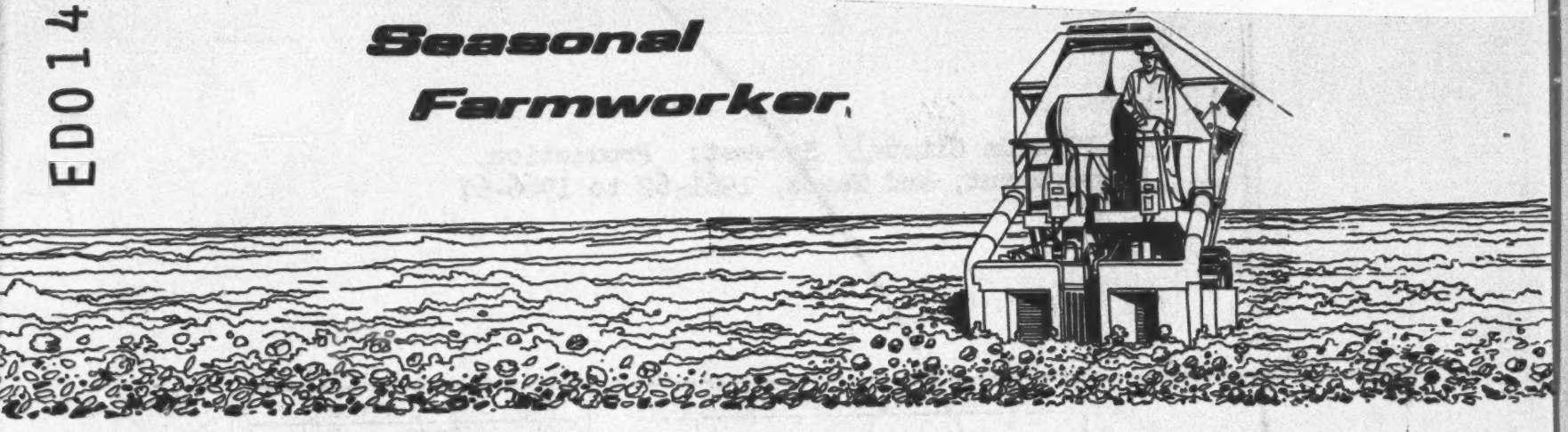
MECHANIZATION and the Seasonal Farmworker



Robert G. Harper

How much will mechanization reduce the number of workers needed on American farms during the next few years? Before speculating, it is well to examine what mechanization involves.

The word suggests engineering and the creation of marvelous new machines. Technological successes are important, but perhaps more important are the horticultural discoveries necessary to the development of plant varieties that can be harvested by machines. In general, selective harvesting with machines - picking the ripe and leaving the unripe for later - has proved thus far to be either impossible or prohibitively expensive. Machines can go over a field only once for most crops, and what is not used is lost. Therefore, if all the plants in a field do not mature at more or less the same time, machine use may be economically unfeasible.

Mechanization need not be spectacular. The appearance of a harvesting machine is its most striking manifestation, but it can also take the form of a series of time-saving innovations in method, each insignificant but together quite important. It is reflected in new kinds of seeds, in precision planting, and in chemical treatment for grasses and weeds. Mechanization is not uniform. A procedure successful in one area may be ineffectual in another because of differences in climate or soil condition.

Mechanization depends on economic conditions. In the case of fruits and vegetables that are sold as fresh produce and therefore require a pleasing appearance, machine harvesting is generally not practical.

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There is some loss in quality for fruits or vegetables that are processed; and, other things being equal, canners customarily prefer the hand-harvested product. Other things are not equal though. Fewer available workers and increasing labor costs mean that the most efficient producer will have a significant advantage. Competition is forcing growers and processors to re-examine beliefs that consumers will not accept a product harvested by machine or that growing conditions do not admit of machine use.

The number of workers needed does not inevitably go down with the advent of harvesting machines. Some innovations merely change the job from one that is particularly toilsome or unpleasant to one that is less so. These are important - workers formerly unable or disinclined to do the job become available - but as many individuals are needed as before. Mechanization may make an operation so efficient that it becomes desirable to increase acreage and production. More workers may be needed.

With these considerations in mind, the following sections will discuss the prospects for mechanization in crops and States where the need for seasonal workers is, at present, greatest or most difficult to fill.

TOBACCO

Mechanization has made little progress and it offers few prospects for tobacco, a crop using over 200,000 workers. Peak employment approached 180,000 in North Carolina in 1966, and not much change is expected this season. The use of mechanical loopers and bulk curers eliminates some jobs and farmers are testing mechanical primers, but these innovations will have a limited impact in the next few years. New tobacco varieties which require only three primings per year could be available by the early 1970's.

In Florida, machines are replacing hand labor in leaf stringing. About 25 percent of the crop was handled by machine in 1966 and about 30 percent will be so handled in 1967. A stringer cuts the number of barn workers in half, although it requires additional field hands. It also speeds the rate of harvesting.

COTTON

The number of hoe hands needed for cotton chopping will probably decline considerably from the 140,000 employed at peak in 1966. Chemicals to control weed and grass growth are becoming cheaper and more reliable. Farmers are more experienced in their use. Observers anticipate that in Arkansas, for example, most of the seasonal labor for preharvest jobs in the 1970's will come from the families of year-round workers.

About nine-tenths of the cotton was harvested by machine in the United States in 1966.

USDA Photo

On the other hand, bad weather can neutralize the effect of these chemical weed killers and create a need for more workers.

The labor savings attainable through harvest mechanization have been largely realized, and peak needs are not likely to go much below the 1966 peak of about 120,000 unless acreage is again cut back drastically. Approximately nine-tenths of the Nation's cotton is harvested by machine now, and much of the remaining acreage is in small plots on hilly, rolling land that does not lend itself to the use of heavy machinery. In the next few years, harvest employment will probably decrease most in North Carolina, Tennessee, and Arkansas.

STRAWBERRIES

Mechanical aids, such as self-propelled carts that enable workers to remain in a picking position while moving down the rows, make strawberry work more palatable than it once was; but real mechanization is not in sight. More than 100,000 workers were engaged in the strawberry harvest in 1966 (many of them were school children), and there are indications that increased plantings and heavier yields may raise labor needs in some States. Employment peaks rise above 25,000 in Oregon, Washington, and Michigan, and go above 10,000 in North Carolina, Tennessee, and California.

TOMATOES

About a fifth of all tomatoes are grown for fresh-market sale and are, therefore, not amenable to mechanization. Fresh-market tomatoes make up most of the crop in Florida and about 10 percent of the crop in California. Of the tomatoes grown for canning or for processing into puree, catsup, juice, and other products, that proportion grown in California - about two-thirds - has become highly mechanized in the past two years. In the other major producers of cannery tomatoes - Ohio, New Jersey, and Indiana - the crop is still almost entirely hand-picked. In 1966, nearly 90,000 seasonal workers were used to harvest 5.7 million tons of tomatoes for fresh-market sale and for processing.

Large numbers of harvest workers - there were over 30,000 in 1966 - will continue to be needed in California. The percentage of cannery-tomato acreage to be harvested by machine has gone up spectacularly from 3 percent in 1964 to about a quarter in 1965 to over two-thirds in 1966. Employment peaks have fallen well below those of earlier years when the bracero system was going strong. Acreage for the processing crop, however, which had been cut back in 1965, went up again very sharply in 1966; and, although peak employment declined somewhat from 1965 to 1966, the total man-weeks of harvest labor used rose 7 percent. Another increase in machine use is foreseen for the coming season; but

acreage, also, is expected to rise, perhaps by about 20 percent. As many - possibly more - workers will be needed as in 1966.

The revolution in tomato-harvest mechanization has been not so much in cutting the number of workers required but rather in changing the kind of workers required. Most machine crews are made up of about 20 persons - a supervisor; one or more harvester operators, forklift operators, and trailer drivers; and fourteen to sixteen sorters. One worker on the machine accomplishes about the same amount of work, according to a University of California study, as two good handpickers; and, whereas most of the sorters have been women and youngsters, a harvest job before mechanization would have called for an adult man. During last year's harvest, the workers did a better job and stayed on the job longer than had been the case in previous seasons.

There are still problems. Canners complain that the skin of the tomato is too often broken and that dirt gets into the breaks, causing the fruit to spoil. Mud smears on the tomatoes' surface result in extra work at the processing plant, and large quantities of dirt in a load mean that the canner is paying tomato prices for soil. More refined machines, better trained operators, and improved methods of handling the fruit will probably resolve these problems. Meanwhile, mechanization has given California producers an advantage over their competitors in other States. One study comparing machine and hand-harvest costs in California in 1965 found that the average cost per ton of machine-harvested tomatoes was $9.84, approximately 40 percent lower than hand-picked tomatoes. As long as this advantage exists, acreage will continue to rise and labor needs will remain high.

Growers and processors in the Midwest and the East maintained the same proportion of the market in 1966 that they had had in 1964, but competition from the mechanized operations in California will exert increasing pressure on them. Some believe that mechanization would involve an unacceptable loss in quality. The main problems, however, are climate and plant variety. Whereas California has a long growing season marked by very little rainfall, growing seasons in the other major producing States are quite humid. About 65 to 85 percent of the crop should be ripe before machines go into the fields. This means that some of the fruit will remain ripe on the vine for some time before being picked. In the arid production areas of California, this is not a problem, but in the wetter climates elsewhere, the ripe fruit rots. Therefore, plant varieties successful in California, those that are firm, thick-skinned, relatively even in maturing, and resistant to disease, must have the additional attribute of being able to withstand wet weather. As yet, no suitable variety has been developed.

Mechanization in these States, then, will be an expensive process, with the cost of harvesters - about $20,000 - being fairly small relative to the cost of plant-variety research. Some growers will be tempted to convert their acreage to crops requiring less capital investment. Others, eventually, will succeed in mechanizing their operations. For the present, however, labor needs will probably not change significantly. In 1966, about 14,000 seasonal workers were used in Ohio, about 9,000 in New Jersey, and about 8,000 in Indiana.

SNAP BEANS

At the season's peak in 1966, about 86,000 workers were employed in the snap-bean harvest. In general, the possibility of reducing this number through mechanization depends on whether the beans to be harvested are bush beans or pole beans. Bush beans, prevalent in the East and Midwest, permit a high degree of mechanization. Pole beans, now grown mostly in the Pacific Northwest, require handpicking.

Oregon accounts for approximately a fifth of the Nation's snap beans. Over 55,000 harvest workers were used there in 1966. Pole beans predominate. Their yield is roughly three times that of bush beans and their quality is significantly better. Producers are reluctant to change. Nevertheless, many are doing so, and perhaps a quarter to a third of the total acreage is now in bush beans. Oregon producers must meet competition from other regions where mechanization has reduced costs. At present, the high quality of their product gives them an edge, but as their competitors improve bush-bean quality, this edge will disappear. Already the disparity is more in the effects of mechanical harvesting than in innate differences in bean type.

Recent developments which may limit the number of workers available to Oregon bean growers could provide an additional incentive for mechanization. Roughly 40 to 50 percent of their pickers are school children. Plans to begin school sessions earlier could mean that they would no longer be available for the late harvest. Also, the 1966 amendments to the Fair Labor Standards Act, as they affect child labor, could limit the use of these workers. It seems likely that a large proportion of Oregon's snap-bean harvest will be mechanized in the next three to five years.

Mechanization has already made considerable headway in New York, Wisconsin, and Florida, and employment peaks in these major producing States do not exceed a few thousand workers. North Carolina had the highest peak in the East in 1966, about 18,000. The harvest there is in the process of being mechanized now, and peak needs are expected to be substantially lower by the early 1970's.

Machines work in relays in this Wisconsin snap-bean field. They can clear a large field at the rate of an acre per machine per hour, and the workers are in radio contact with the cannery so that just the right number of beans will be picked to keep up with the canning operation.

USDA Photo

BUSHBERRIES

About 70,000 workers are now required for the harvesting of raspberries, blueberries, and other bushberries. Employment peaks approach 50,000 in the Pacific Northwest, 20,000 in the East, and 12,000 in the Midwest. The development of a self-propelled blueberry harvester offers the possibility of substantial labor savings, but this may be offset, in part, by increased production.

An over-the-row blueberry harvester is operated by a three-man crew, costs about $35,000, and replaces approximately 125 workers. It does not damage the bushes but it has trouble handling large yields and removing trash. Approximately 10 of these machines will be used in New Jersey in 1967 and approximately 16 in Michigan, perhaps cutting labor needs by roughly 15 to 20 percent in these States.

Several types of raspberry harvesters have been tried in Washington and Oregon, and some new acreage seems to have been planted with mechanical harvesting in mind. Thus far, however, these machines' success has depended on optimum conditions found only infrequently.

Several machine methods of harvesting blueberries are in operation. According to this method, a two-bush collecting unit is moved into place beneath the bushes. The gas-powered generator in the foreground provides electricity for vibrators that shake the berries from the bushes over the collecting unit. USDA Photo

The potato harvest is roughly 80 to 90 percent mechanized in most parts of the country now, and a significant displacement of labor is taking place only in Maine and North Carolina.

USDA Photo

POTATOES

Although peak potato-harvest employment exceeded 65,000 in 1966, the only large concentrations were in Maine (27,000) and Idaho (10,000). The potato harvest is roughly 80 to 90 percent mechanized in most parts of the country now, and a significant displacement of labor is taking place only in Maine and North Carolina.

Approximately 200 new combine harvesters will be added in 1967 to the 700 used last year in Maine. Since the single-row harvester displaces about 5 workers and the double-row harvester displaces about 20 workers, peak needs in Maine may decline by perhaps 2,000 to 3,000 workers this year.

SUGAR CROPS

Precision planters, pelleted monogerm seed, and mechanical, chemical, or electronic thinners will continue to pare down the number of hoe hands needed for sugar-beet work. Approximately 8,000 hoe hands worked in Colorado last year and from 3,000 to 6,000 in each of eight other Western and Midwestern States. Peak needs should diminish from year to year, perhaps to the point where the need for hand labor is virtually eliminated. The reduction in the sugar-beet work force has sometimes had a side effect of creating labor shortages in other crops. Migrant sugar-beet workers were formerly often used to harvest various fruits and vegetables after sugar-beet work had ended.

There has been little progress in mechanizing the Florida sugarcane harvest, which requires about 10,000 workers. Soft soil and wind that causes the cane to grow at oblique angles have thus far thwarted use of the machines that harvest most of Louisiana's sugarcane.

Several machines have been developed for use in Florida that, according to the manufacturers, show promise. However, use of these machines would require some changes in the milling process and this will deter their widespread use.

GRAPES

No large-scale breakthroughs are foreseen in harvesting California grapes, a job that requires about 55,000 workers. Improved methods are raising productivity but production is also going up.

CHERRIES

The Michigan cherry harvest now calls for approximately 30,000 to 35,000 workers. This number will probably go down in the next few years as the

use of self-propelled tree shakers becomes more widespread. Roughly a quarter of the crop (which was unusually small due to frost damage) was harvested by machine last year. Under ideal conditions, on level land, a five-man crew using a shaker can clean a tree in 90 seconds. Hillside orchards are a problem, however. Although current models are not completely efficient, some growers believe that they must mechanize in order to stay in business. Almost all Michigan cherries are processed.

In Oregon, where 14,000 cherry pickers worked last year, growers have had varying degrees of success with tree shakers. In general, the machines will have to be improved before they can effect any substantial reduction in labor needs.

APPLES

Tree shakers are unlikely to have much effect on labor requirements in Washington, where 22,000 apple pickers were used in 1966, or in New England, where labor is especially scarce. Over four-fifths of the crop in these areas is sold fresh. Indeed, as trees now growing in Washington reach bearing age, the number of workers needed will go up.

In other States where labor is a problem - New York, Virginia, West Virginia, and Michigan - about 50 to 60 percent of the crop is processed. Shakers being tried in these States have two to four-man crews, replace about 15 workers, and cost approximately $25,000. At present, they cause excessive bruising and tree damage, and they are difficult to move. Considerable quantities of leaves and twigs fall with the fruit; lower limbs must often be pruned from the trees; and the hilly terrain that is common in many apple-growing areas resists machine use. If these problems can be resolved, at least to some extent, and if processing-plant schedules can be arranged to handle the shaken fruit quickly, labor needs may begin to diminish by the early 1970's. At best, the process of mechanization is likely to be slow, because orchards will require modifications in tree size and structure for peak effectiveness.

PEACHES and Other Tree Fruit

Tree shakers have not been used commercially for harvesting peaches, although this might be possible in California where nine-tenths of the crop goes to processors. A trend away from selective picking toward central grading stations promises more immediate labor savings. Some California growers who made this change believe that it reduced the number of pickers they needed by 15 to 25 percent. Also, with this system, the pickers need not be experienced.

Pear trees are brittle and vulnerable to disease. Shaking is possible, but bark damage and the threat of infection present a serious problem. Shakers are being used more successfully in apricots and prunes. In California, apricot harvesters replaced roughly 100 workers each in 1966, and a boom-shaker prune harvester operated by seven workers produced approximately the same tonnage as 55 handpickers. Peak employment last year in California was 24,000 for peaches, 21,000 for apricots, 16,000 for prunes, and 12,000 for pears.

Mechanization does not appear feasible for the South Carolina peach harvest, performed by about 20,000 workers. Most of the South Carolina peaches are sold fresh.

CITRUS

There have been experiments with tree shakers and air-blast machines to harvest citrus, but no satisfactory method has been devised to replace the handpicker. Apart from problems of fruit and tree damage, machines harvesting Valencias would jar loose the next year's crop as well as the ripe oranges. About 20,000 to 25,000 pickers are used now to harvest Florida citrus, and some estimates, based on burgeoning production, place the number of pickers needed by 1975 at 50,000.

CUCUMBER (Pickles)

Peak cucumber-harvest employment reaches 25,000 in North Carolina, 15,000 in Michigan, and 5,000 in Texas and Wisconsin. Mechanization has made little headway in the South where labor requirements, if anything, may rise somewhat with an increase in acreage. Machines are used in the Midwestern States, but their effectiveness is limited by the lack of a plant variety with an adequate yield for a once-over harvest. Michigan growers used approximately 30 mechanical harvesters in 1966, primarily for a final cleanup after a field had been hand harvested several times. Although mechanization may not reduce peak needs for some years to come, a mechanized cleanup operation would be an important achievement. In the past, labor problems have sometimes resulted from workers' having left before the harvest was over in order to place their children in school.

ASPARAGUS

Although it seems likely that machines will eventually be used to pick a sizeable part of the Nation's asparagus, labor needs will probably not be much reduced for the next four or five years. The development of suitable machines must be accompanied by extensive changes in cultural practices.

A grower in Delaware used 13 machines in 1966, each of which cut 40 acres a day. He estimated that these machines enabled 30 workers to do the work of 200. Other Delaware growers, however, rejected machine harvest, feeling that it meant an excessive loss in quality and yield. Also, they found that labor savings in the field were lost again in the processing plant where additional sorters were needed. Fourteen machines, each costing $2,200, will be used in New Jersey this season. If successful, each machine may replace three or four workers.

The principal asparagus producers (and their employment peaks in 1966) are California (5,600), New Jersey (6,900), Washington (4,000), and Michigan (4,000).

CELERY

Several Florida celery growers have turned to machine harvesting this season. This change has not reduced the number of workers needed, but it has made recruitment easier by enabling the former cutters to do the less arduous job of stripping the celery.

CONCLUSION

In the next two or three years, mechanization will probably have the greatest impact on cotton chopping in the South, snap-bean harvesting in the Pacific Northwest, and cherry harvesting in the Midwest. Tobacco, strawberries, and citrus, on the other hand, present seemingly insuperable problems; and peak labor needs for these crops will remain high for the foreseeable future. The great labor savings due to innovations in cotton harvesting and sugar-beet cultivation have almost run their course. Further reductions will come fairly slowly but steadily. Progress in most vegetables and tree fruits will be governed largely by such considerations as the availability and cost of labor, trends in consumer demand for fresh and processed commodities, and competition among producers. Some form of mechanization is possible in almost all crops. Its timing depends on the economic pressures that affect production of any given crop in any given area.